



WinDNA 2000 Overview Featuring SQL Server 2000

**Paul Flessner
Vice President
Microsoft Corporation**

A large space shuttle is shown launching vertically on the right side of the image. It has a white body with orange and black stripes. Bright orange and yellow flames and white smoke are coming from the engines at the bottom. In the top right corner, there are several small icons of computer windows or documents connected by lines.

POWER

Windows DNA 2000

Readiness Conference

/// featuring SQL Server 2000

Business Applications

Business Operations

Programmability

Transactions

Performance

Interoperability

Business Intelligence

Huge Databases

Complex Queries

Data Transformation

Closed Loop Analysis

Core

Reliability
Availability
Scalability
Manageability
Security
Replication

Knowledge Management

Content Indexing/Search

Content/Web Server

Tracking

Workflow

Application Architecture

A quick history

- **Monolithic '60-80's**

- Easy to Build
- Difficult to maintain
- Poor Interop
- Difficult to scale
- Still exist

- **2-tier '80-90's**

- Rich Services
- More open
- Somewhat difficult to scale
- Difficult

- **n-tier (Web) '90-...**

- Stateless or Loosely coupled
- Protocol level Interop
- Limited functionality

- **The Web Affects Everything**

- **Application Architecture Continues to Evolve**
 - More Server Centric
 - Highly scalable and flexible
 - Open and discoverable
- **Business Applications Get More Complex**
 - Business to Business

Windows DNA Web Application Platform

Client Tier

Browser

Rich Client

Devices

Application Logic Tier

Application Services

ASP/COM+
Application

IIS/ASP, COM+/MTS, MSMQ,
ADO/OLE DB Data Access,
Active Directory, XML,
Commerce

Data Tier

Data Access and
Storage

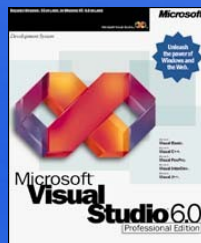
Legacy Host

SQL Server

Other Database

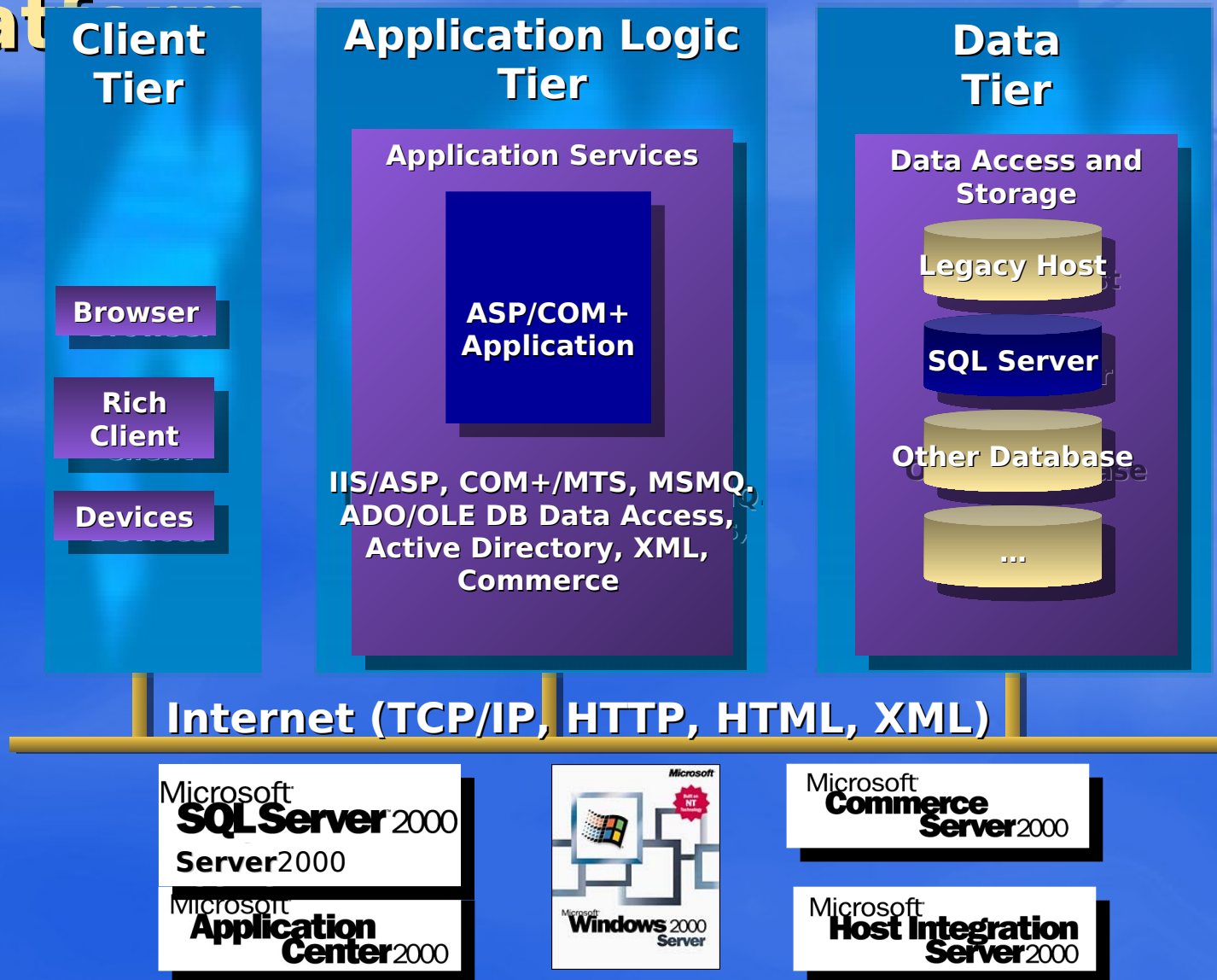
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Internet (TCP/IP, HTTP, HTML, XML)



Windows DNA 2000

Next Generation Web Application Platform



SQL Server 7.0 Momentum

www.microsoft.com/sql/fastfacts

- **Market Share Leader on NT**
 - 71% unit share on Windows NT
 - 86% revenue growth in 1999
 - 13.3 million seats in 1999
- **Easiest to use and manage**
 - 3x easier than Oracle - A.I.R. study
 - 3.7x lower TCO than Oracle - Aberdeen Group
- **World Record benchmarks**
- **Great on the Web**
 - 68% of IT Web applications - Zona Research
 - Six of the top 10 retail sites for Christmas '99 - PC Data
- **Best platform for Business Intelligence**
 - Most comprehensive DW platform
 - Most widely supported DW platform



SQL Server 7.0

Customer Feedback

- **Things we did Right**
 - Competitive Features
 - Focus on Ease of Use
 - Quality (reliability, upgrade, backward compatibility)
 - Scalability (desktop to server)
 - Data Warehousing (solution based)
 - Listened to Customers
- **Things to Improve**
 - Continue to improve Reliability/Availability (Platform)
 - Scalability (>8SMP,VLM,VLDB,Multi-Node, Desktop)
 - Internet Support (XML and Content)

SQL Server 2000 - Highlights

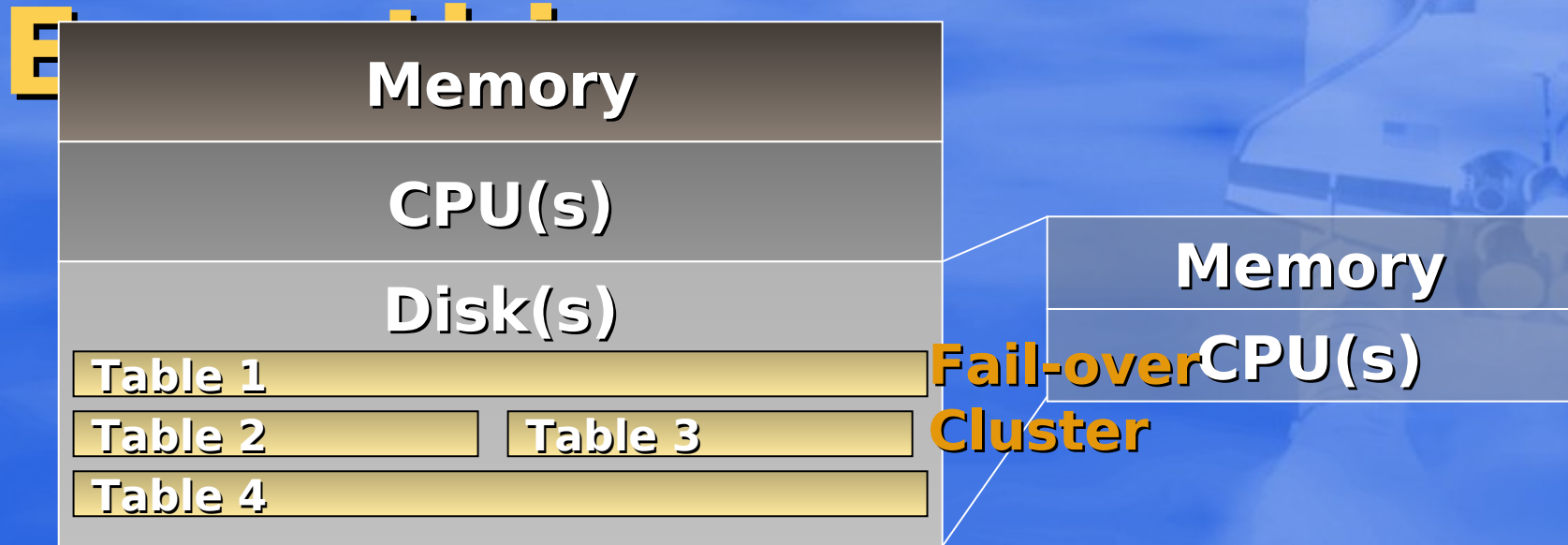
- **Scalability and Availability**
- **Internet and XML**
- **Data Warehousing**
- **Many, Many New Features**

Quality! Quality! Quality!

Database Scalability

- **Two Primary Methods**
 - **Scale-up**
 - **Shared Everything (SMP Configuration)**
 - **Scale-out**
 - **Shared Nothing Cluster**

Scale-up: Shared

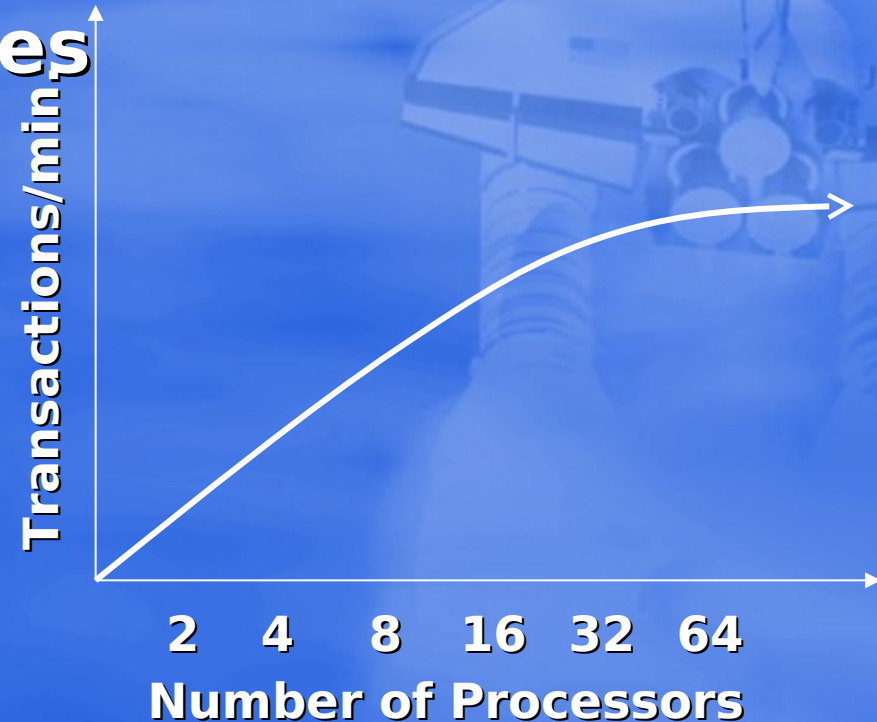


- **Single node**
 - CPU(s) access any/all memory or disk
- **Pro's**
 - Simplicity (management)
- **Con's**
 - Single Point of: Failure, Scale, Upgrade (hw cost)
 - Will Bottleneck on shared db resources

Scale-up: Shared Everything

- Shared DB Resources

- Locks
- Log management
- Buffer Pool
- I/O
- Procedure Cache
- Transactions



Key Point: Increasing processor speed and number of CPU(s) will eventually result in diminishing throughput due to shared resource contention

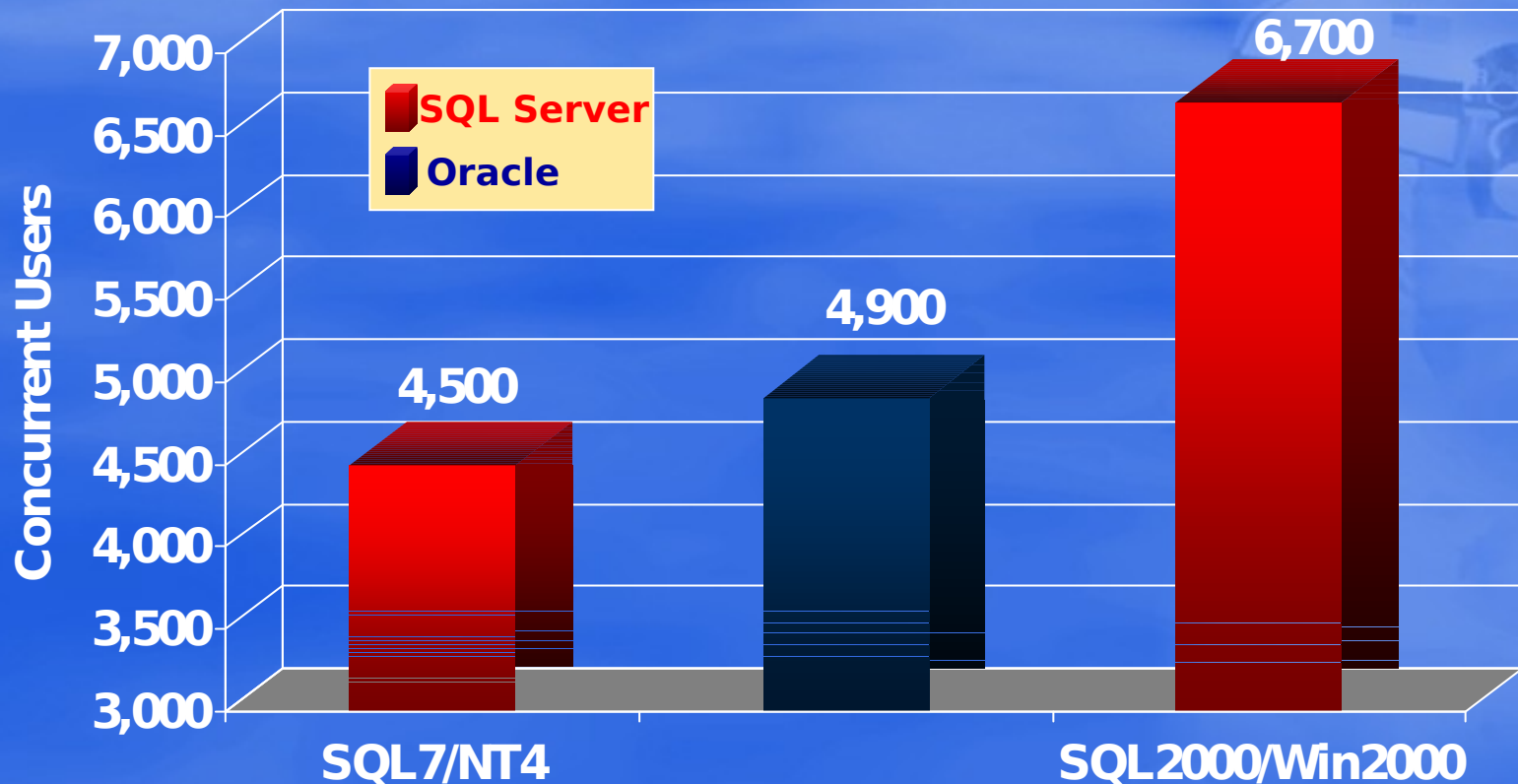
To The Point...

- **Unisys+SQL Server 2000: e-@ction ES2085R**
 - **48,767 tpmC @ \$19 /tpmC (available 8/1/00)**
- **Sun+Oracle8i: Starfire Enterprise 10000**
 - **115,395 tpmC @ \$105 /tpmC (available 8/22/99)**
- **Impressive performance BUT.... Very Very Expensive!**
- **Oracle8i: 8x more CPUs for 2.3 x throughput**
- **SQL Server 2000 delivers 3.3x more trans/CPU**
- **The first 48k tpmC cost \$0.98M**

This is Scalability???

Scale-Up

SAP SD Industry Benchmark



- **SQL Server**
 - 37% more scalable on the same Hardware
 - 60% market share on new US SAP Installs
 - Now - capable of handling ALL SAP customers

Scale-Out: Shared No

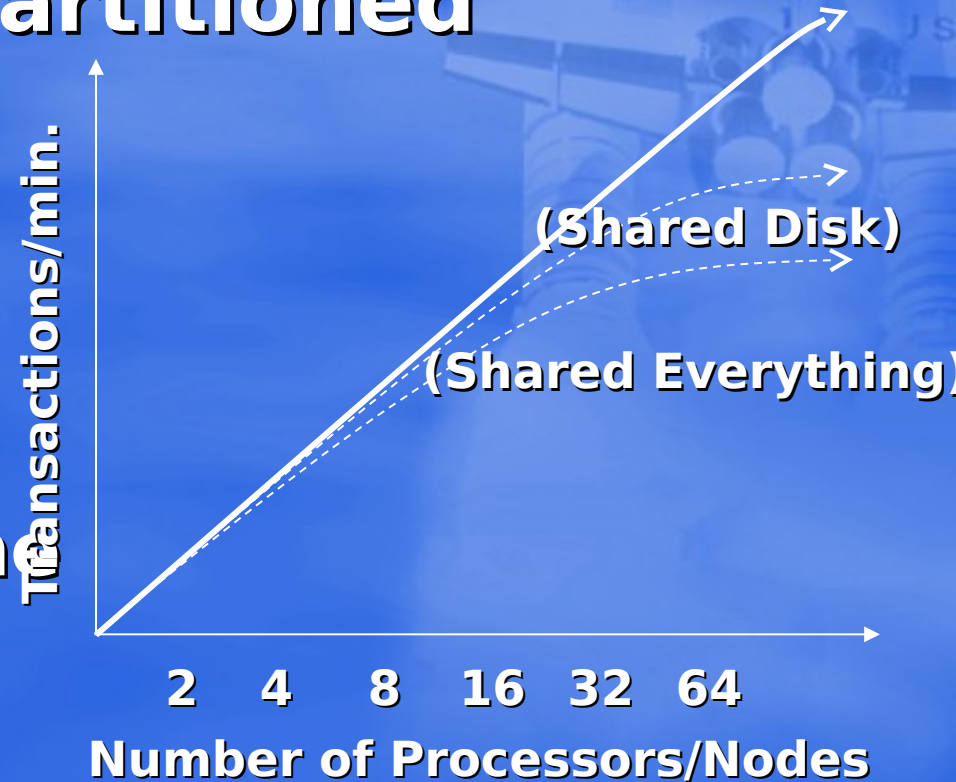
Memory	Memory	Memory
CPU(s)	CPU(s)	CPU(s)
Disk(s)	Disk(s)	Disk(s)
Table 1	Table 1	Table 1
Table 2	Table 2 Table 3	Table 3
Table 4	Table 4	Table 4

- **Multiple nodes - Single System Image**
- **Pro's**
 - Tremendous scalability - add nodes
 - Smaller incremental upgrade costs
 - Powerful tuning and availability
- **Con's**
 - Complexity (management)

Scale-Out: Shared Nothing

- All Resources Partitioned

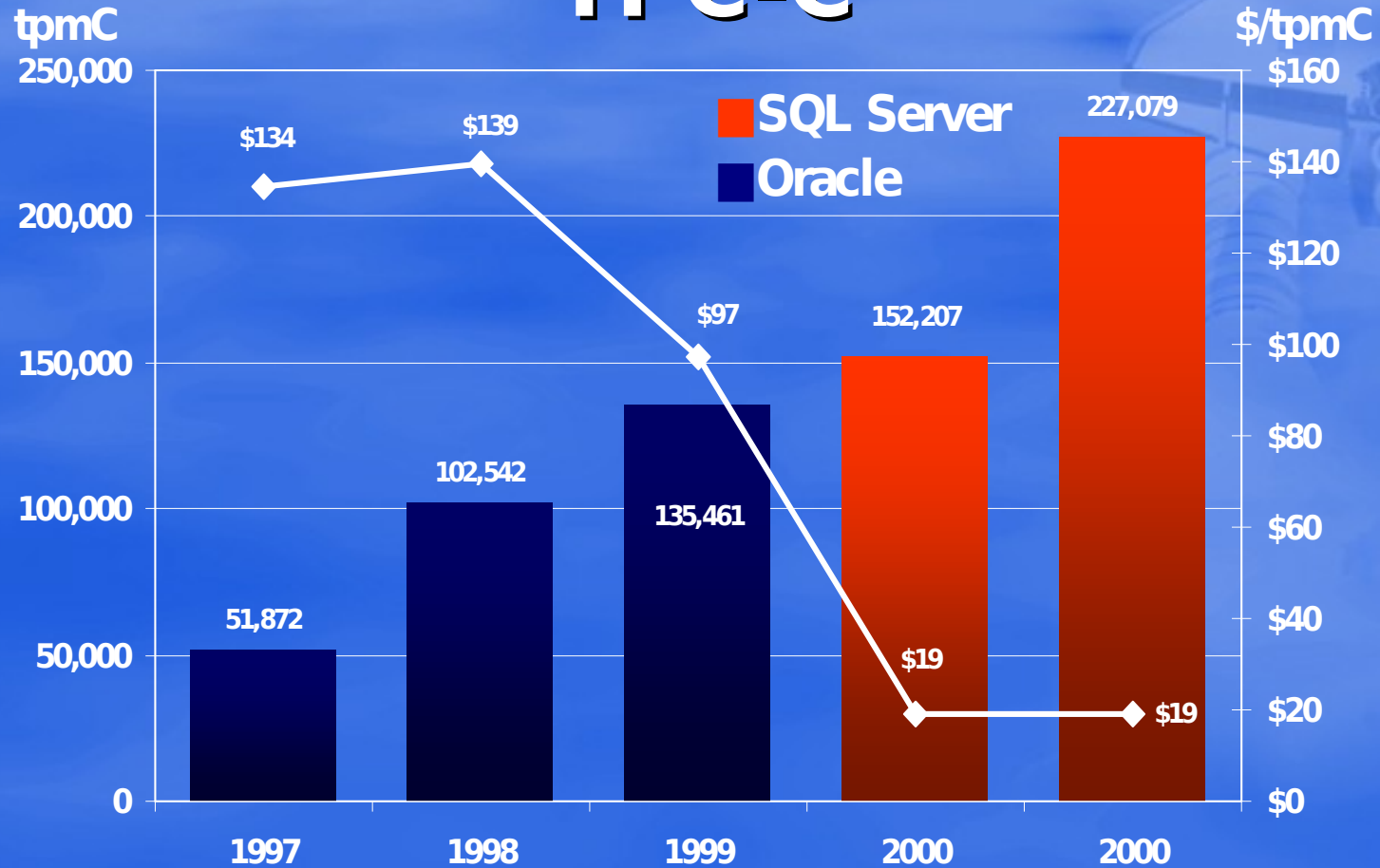
- Locks
- Log
- Buffer Pool
- I/O
- Procedure Cache
- Transactions



Key Point: *Best scalability and failure containment*
Challenge: *Make it easy to manage*

To The Point...

TPC-C

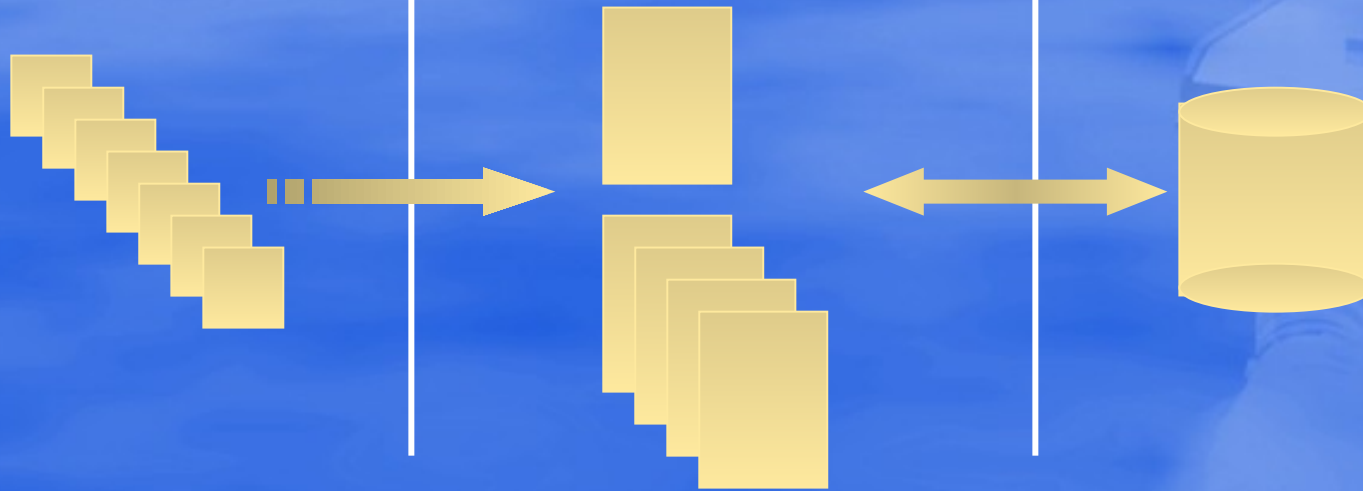


This is Scalability!!!

TPC results as of 2/17/00

Web Applications Today

Client/Browser Application Server(s) Database Server



- **Application Servers**
 - Clone and go \$2-\$20k/server
 - Difficult to manage
- **DB Server: Single SMP machine**
 - Must buy a new and larger SMP server to scale
 - Unix SMP costs can be 10x of commodity 4x or 8x SMP
 - No failure containment for non-disk components
 - Server Fail-over requires another expensive SMP

Web Applications

WinDNA2000

Client/Browser Application Server(s) Database Server(s)
Shared Nothing



- **Application Servers**
 - Manage with Application Center 2000
- **Database Servers (Shared Nothing Cluster)**
 - SQL Server 2000
 - Partitioned views scale very well
 - Great flexibility, fail-over, very economical
 - Increased management overhead (for now)

SQL Server 2000 - Scalability

- **Scale-up (Shared Everything)**
 - **W2K: AWE Memory Support (64gb)**
 - **64bit version of SS with W2K64**
- **Scale-out (Shared Nothing)**
 - **Partitioned View Support (multi-node)**
 - **Query and Update Transparency**
 - **Full Multi-node transactions**
- **General Scalability**
 - **Parallel Create Index**
 - **Indexed Views**
 - **Indexes on computed columns**
 - **Super-Scan**
 - **Merry-go-round Scans**
 - **Improved read-ahead**

SQL Server Scalability Proof-Points

- **World Records (All Platforms)**
 - **TPC-C - 227,079k tpmC @ \$19/tpmC**
 - **SAP Retail - 3.165M line items/hr**
 - **PeopleSoft**
 - **Financials: 4600 concurrent users (c-users)**
 - **HR: 21,000 c-users**
- **World Records (NT)**
 - **TPC-H - 1,291 QphH @ 100GB**
 - **SAP R/3 - 6700 SD users**
 - **Onyx - Customer Call Center, 10k c-users**
 - **Pivotal - CRM, 20k c-users**

Scalability Summary

- **Shared Everything**
 - Shared resources limit scalability
 - Diminishing returns on HW investment
- **Shared Nothing**
 - Partitioned resources scale very well
 - Challenge is to make it “easy”
- **SQL Server Futures**
 - **Shared Everything**
 - Continue great support
 - Best today on comparable hw
 - **Shared Nothing**
 - SQL Server 2000 is the first installment
 - More to come...

SQL Server For WindowsCE

- **Robust *general purpose* RDBMS**
 - **Supports all WinCE CPU's**
 - PocketPC, H/PC and embedded devices
 - **Robust SQL DML/DDDL, cursors, cascading RI, transactions, security, encryption, UNICODE**
- **Strong compatibility with SQL Server**
 - **Bi-Directional Merge Replication**
 - **ANSI/ SQL Server 2000**
- **Flexible server/desktop connectivity**
- **Familiar tools (eVB/eVC/ADO/OLEDB)**
- **Hands-off operation**

SQL Server 2000 - Availability

- **On-Line Re-ORGanization**
 - Within a page and page ordering
 - Data and Index pages
 - Less than 20% throughput impact
- **Improved Fail-over support**
 - Much easier to setup and manage
 - Full-text Search is now cluster aware
 - Supports up to four nodes (active/active)
- **Integrated Log shipping**
- **Faster Differential Backup**
- **“Serverless” hardware backup**
- **Application point-in-time recovery**

Important Features

- **Programmability**
 - **Cascading Referential Actions**
 - **User Defined Functions**
 - **Instead Of Triggers**
 - **Trigger ordering**
 - **New Datatypes: bigint, variant, table**
 - **Improved Documentation**
 - **Replication, DTS, Fail-over: re-written**
 - **Online Links for Feedback**
 - **Updateable to incorporate your**

Important Features

- **Programmability (tools)**
 - **Query Analyzer**
 - Integrated T-SQL Debugger
 - Statement tracking (mini-profiler)
 - Performance Profile from the client
 - Per execution - bytes sent/received, query execution time, wait time, client processing
 - **Index Tuning Wizard**
 - Integrated with QA
 - Indexed Views
 - Computed column indexes

Important Features

- **Data Replication**
 - **Transactional**
 - DTS enabled
 - Queued Replication (disconnected)
 - Improved Snapshot (concurrency)
 - **Merge**
 - 2x faster Server to Server
 - Many new conflict resolvers
 - **Add/Drop Column Schema replication**
 - **Attach and GO subscribers**

Important Features

- **Manageability**
 - **WMI (WBEM) Support**
 - Manage via standards-based infrastructure
 - **Copy Database Wizard**
 - Copies 1:n dbs to another instance or server
 - Includes: Logins, SP, Jobs, etc...
 - **Log Shipping**
 - Provides 1:n warm standby servers
 - Don't have to be geographically co-located
 - Creates a 100% consistent copy of the db
 - Backup servers can be promoted to primary

SQL Server 2000 - Objectives

- **Scalability and Availability**
- **Internet and XML**
- **Data Warehousing**

Application Hosting

- Two Ways to make it happen

SS 6.5
Payroll DB



SS 7.0
Order DB



SS 7.0
Inventory DB



- Multiple DBs

- Shared System Resources
- Configuration by db
- Column Level Collations

SS2K



Order DB

Payroll DB

Inventory
DB

- Multi-Instances

- Detach/Attach db 7.0 to 2K
 - Multiple 2K, with 6.5 or 7.0
- M Order DB 's per
ISS 7.0 or 6.5



Inventory DB
SS2K

Payroll DB
SS2K

SQL Server 2000 XML Features

- URL access via HTTP to SQL Server
- Annotated Schema - XML view of the DB
- Retrieving XML data
 - FOR XML - SQL extensions that return XML
 - XPath - allows XML developers to query via the XML view of the DB defined by an Annotated Schema
 - Both can utilize XSL/T to transform/format results
 - For example, convert XML to HTML for browser apps
- Storing XML data
 - OpenXML - allow TSQL developers to map XML to tables in stored procedures

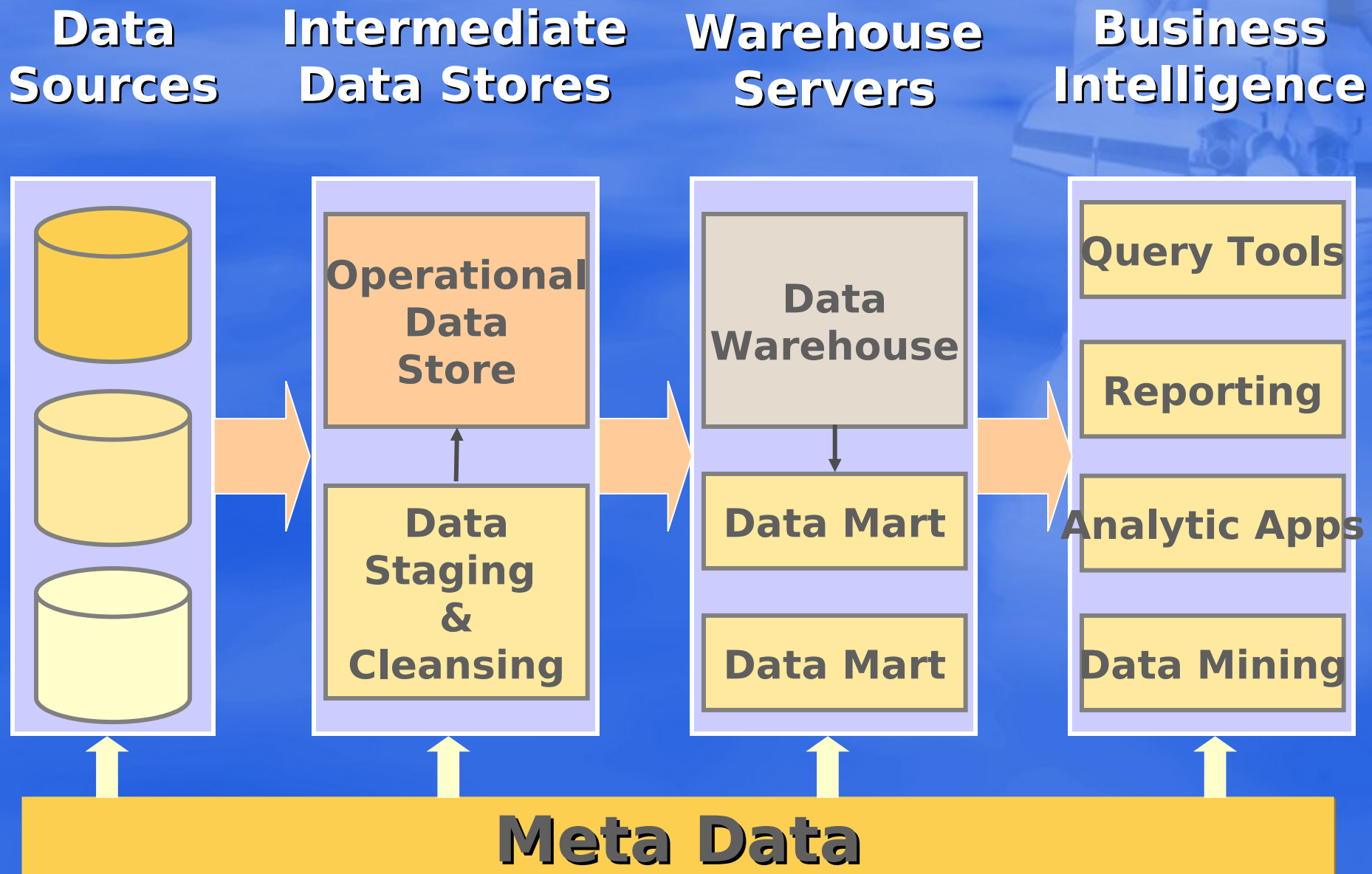
Internet Features

- **Full-Text Enhancements**
 - **Improved Performance**
 - Full Crawl
 - Incremental Update
 - Change Tracking (new)
 - **Content Filters (Excel, Word, etc.)**
- **Security**
 - **Auditing**
 - **Secure out-of-the-box (setup)**
 - **Encryption - logon and server**
 - **Kerberos (with delegation)**
 - **C2 certification**

SQL Server 2000 - Objectives

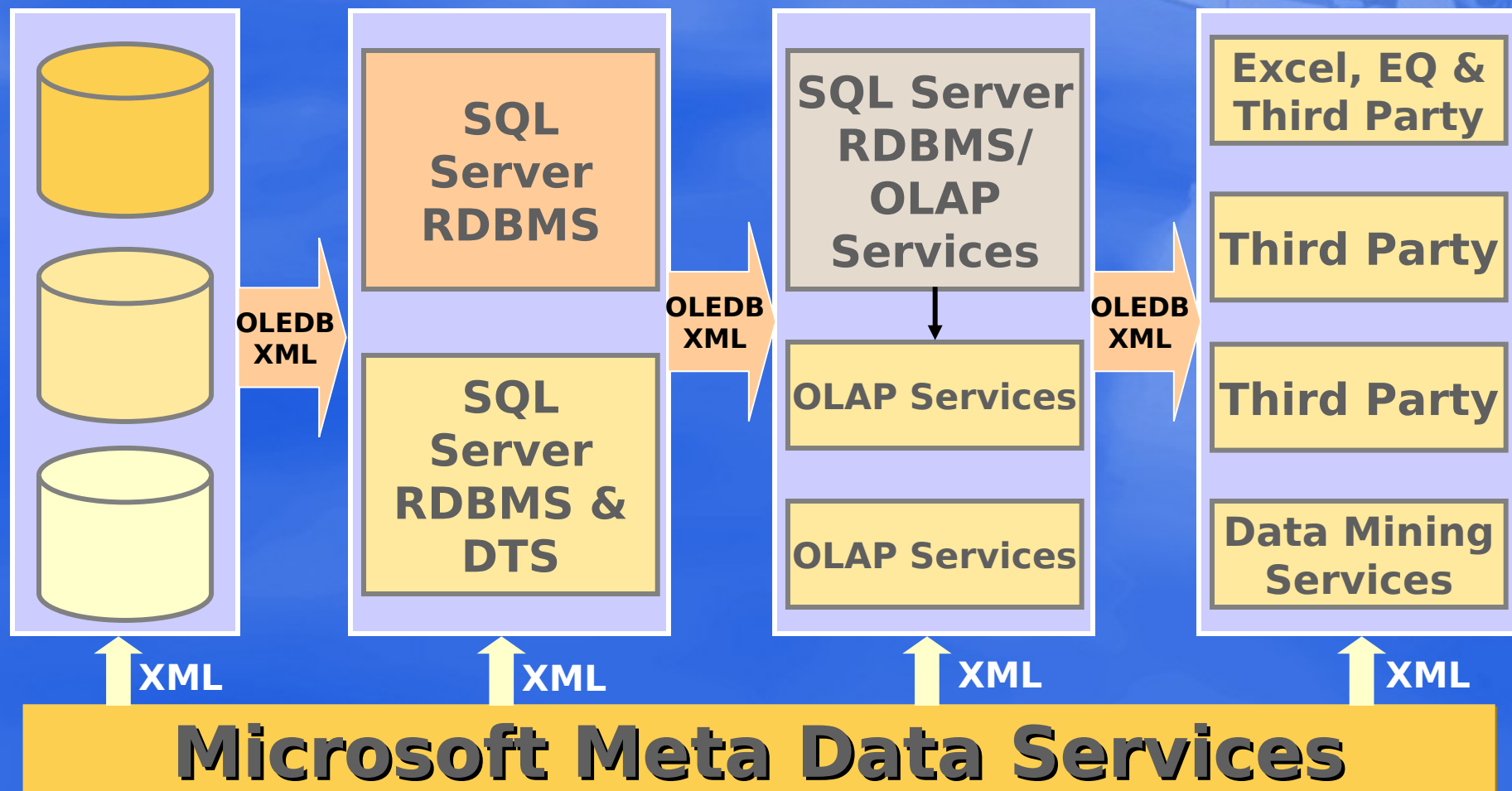
- **Scalability and Availability**
- **Internet and XML**
- **Data Warehousing**

Data Warehousing



SQL Server Data

Data Sources **Intermediate Data Stores** **Warehouse Servers** **Business Intelligence**



OLAP Services

- **Improved security: cell and member**
- **Dimensions:**
 - Great flexibility (parent-child)
 - Custom rollup
 - Industry leading scale (100M+)
 - Slowly changing and distinct count
- **Multi-server support**
- **Internet support**
 - HTTP, uses IIS for auth/sec
 - Web deployment
 - Distinct count and huge dimensions for hit analysis

Data Mining Services

- **Reconcile**
 - **Model-driven analysis (OLAP) with**
 - **Data-driven analysis (Data Mining)**
- **Two core algorithms**
 - **Clustering (EM)**
 - **Classification (decision trees)**
- **OLE DB for data mining**
- **Tight integration with SQL Server**
- **Developed in partnership with**

DTS

(Data Transformation Services)

- **Multi-Phase Data Pump**
 - **Restartability - Step and Package**
 - **Aggregation**
- **Supports PK/FK/Constraints**
 - **Heterogeneous OLE DB (Oracle, DB2)**
- **DTS Package**
 - **SaveAs VB code**
 - **Disconnected Editing**
 - **Automatic registration (deployment)**
 - **“Execute” one package can call**

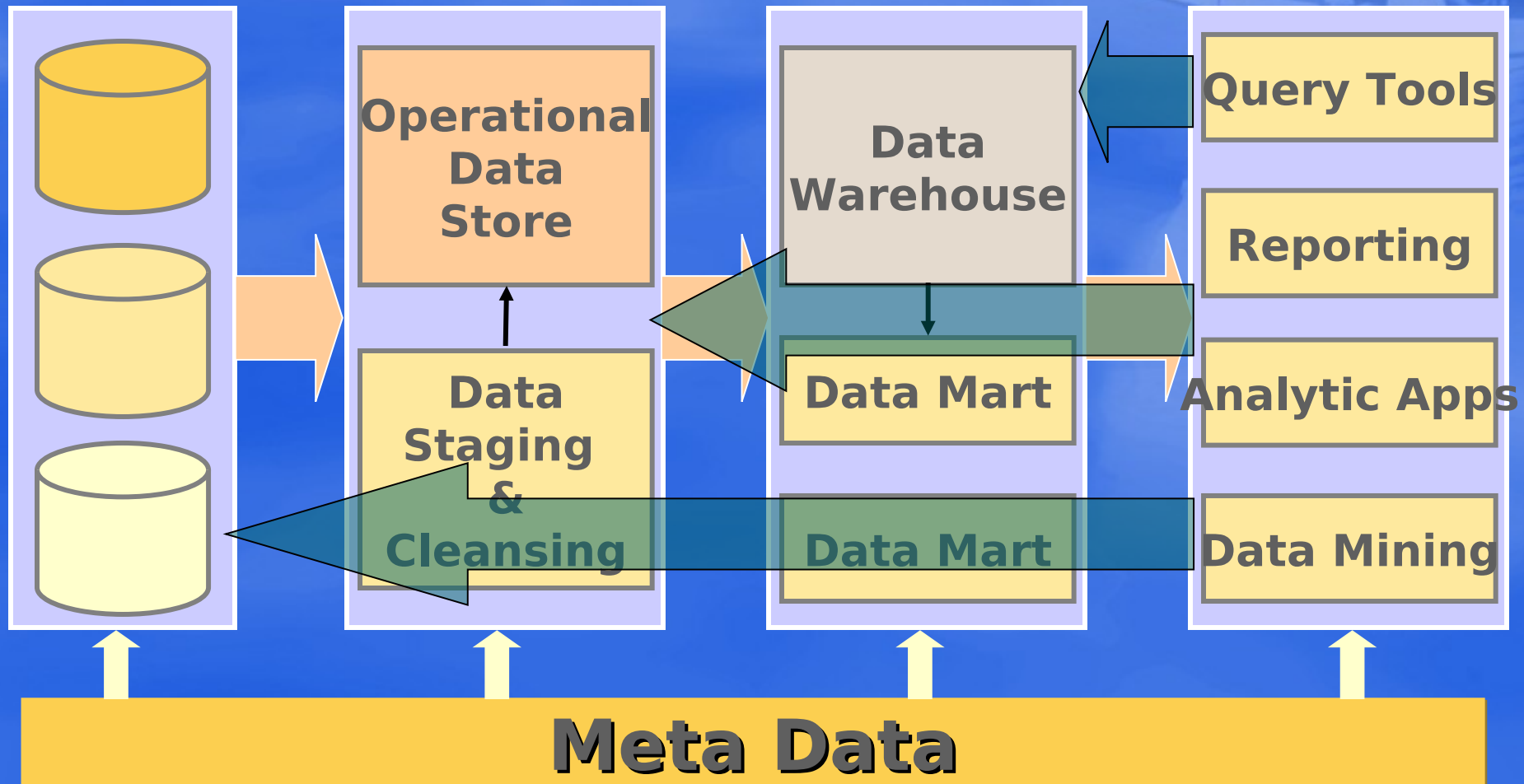
Closed Loop Analysis

**Data
Sources**

**Intermediate
Data Stores**

**Warehouse
Servers**

**Business
Intelligence**



Commitment To Quality

- ***Every Release Is Better!!!***

Type of Test	SQL Server 7.0	SQL Server 2000
Functional	65,000	96,000
Stress	158	474
Long Haul Stress	N/A	63 days so far... 30 Customer workload
Internal EAP	24	40 17 Prod. today 23 more to go
External EAP	12	15 Customers
Beta 1	N/A	9/99 - 1k customers
Beta 2	N/A	Soon - 10k's customers

SQL Server 2000

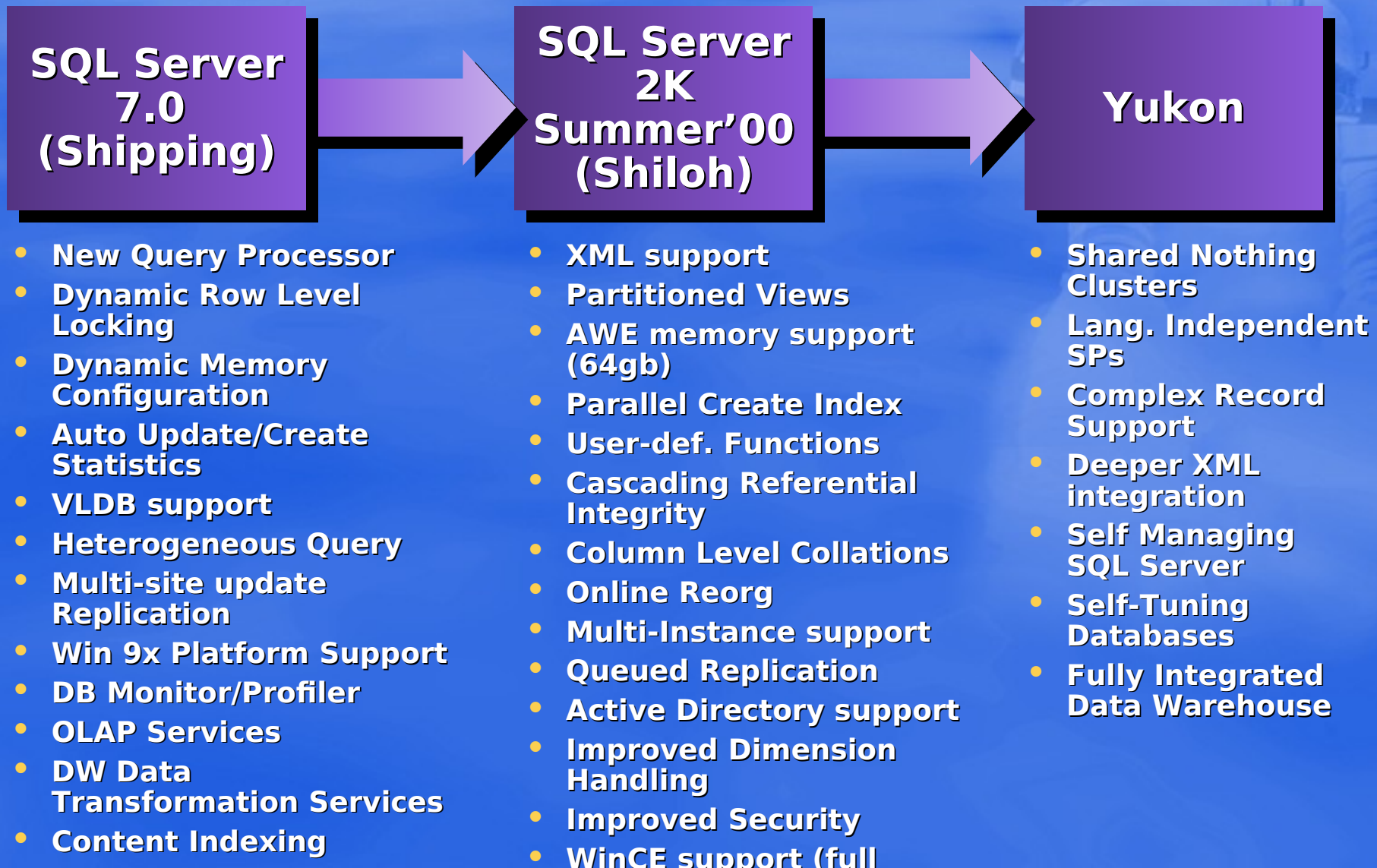
Summary

- Scalability and Availability
 - Device to Cluster
 - #1 benchmarks:
 - TPC-C, Psoft, SAP, GPSI, Onyx, Pivotal, TPC-H
- Important NEW features
 - Programmability (XML, UDFs, Tools)
 - Data Warehousing (Mining, OLAP, Intg)

On Schedule to release this Summer

- Quality = Reliability = Customer Sat

SQL Server Roadmap



POWER

UP



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